Rocky Mountain Spotted Fever

Rocky Mountain Spotted Fever (RMSF) is a Class C disease. It must be reported to the state within five business days.

As of January 1, 2010, cases of RMSF are reported under a new category called Spotted Fever Rickettsiosis (including Rocky Mountain spotted fever). This change was made to better reflect the scope of cases being reported under the previous heading of RMSF, as many of those cases were not identified as being specifically caused by *R. rickettsii*.

Epidemiology

Rickettsia rickettsii, a bacterial organism spread to humans by the bite of ixodid (hard) ticks, is the etiologic agent of RMSF. The two major vectors of RMSF in the U.S. are the American dog tick, *Dermacentor variabilis* and the Rocky Mountain wood tick, *Dermacentor andersoni*. Other domestic tick species have been shown to be infected with *Rickettsia rickettsia*, or have been identified as experimental vectors in laboratory studies. Some domestic ticks have no role in transmission in the U.S. but are considered important vectors in Central and South America. Although the vector of RMSF is the tick, exposure to ticks or tick-infested habitats is only reported in 60% of the cases.

The rickettsial organism is maintained in nature in a complex life cycle involving ticks and mammals. The tick acts as both vector and reservoir of the disease. Humans are accidental hosts and do not play a role in the natural transmission cycle. Even in areas from which most human cases are reported, only about 1% to 3% of the tick population carries the organism, therefore the risk of exposure is relatively low.

The disease is endemic in areas of North, Central and South America. Other closely related organisms cause different types of spotted fevers worldwide. Over half of the U.S. cases are reported from the south Atlantic region (which extends from Delaware south to Florida). Infection also occurs in the Pacific coastal region and the west south-central region, (which includes Arkansas, Louisiana, Oklahoma and Texas). Although initially identified in the Rocky Mountain states in 1896, a very small percentage of cases has recently been reported from this southern area.

Laboratory confirmation is usually done by serology. Several well-validated serologic assays are available, but the reference standard is indirect immuno-fluorescence (IFA). Polymerase chain reaction (PCR) and isolation of the organism from tissues are other means of diagnosis. Early infections, which are often difficult to diagnose, are characterized by sudden onset of fever, headache, and myalgia, followed by a rash. Early diagnosis can be difficult. Without prompt, appropriate antibiotic therapy, the disease can be fatal. If epidemiological and clinical clues lead to a high degree of suspicion, therapy should never be delayed while waiting for laboratory confirmation. While the number of reported cases has increased, the case fatality rate in persons who become ill from RMSF has declined to a low of less than 0.5%.

No licensed vaccine providing immunity to RMSF is available. Limiting exposure to ticks is an

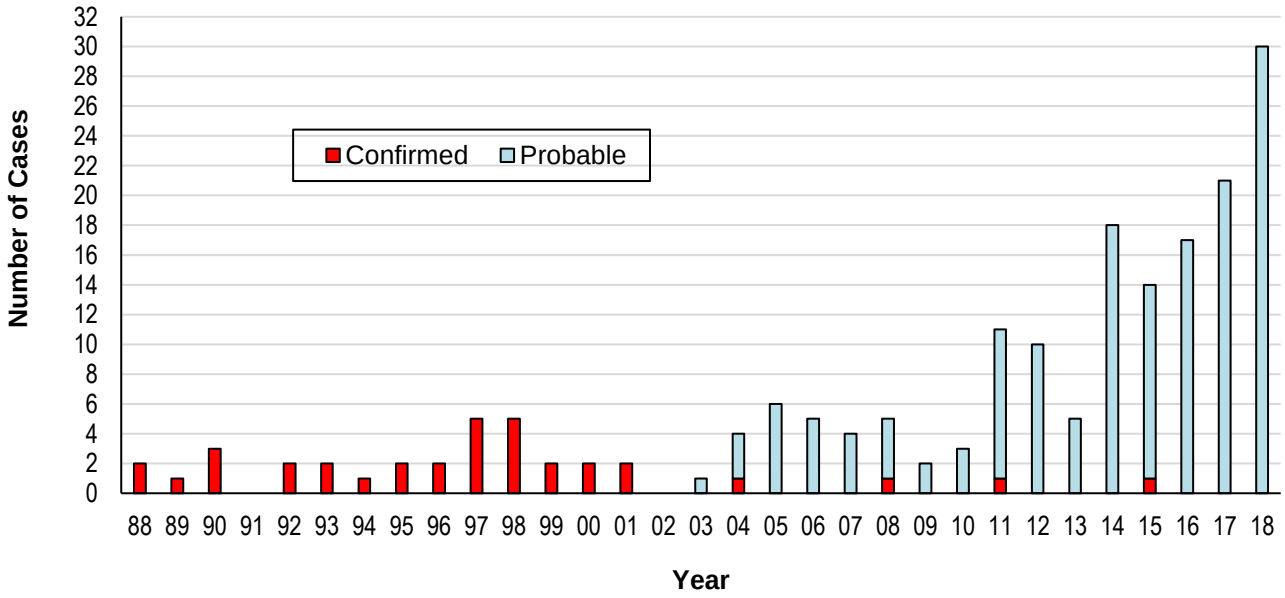
important method of prevention. Since elimination of all activities resulting in tick exposure is impossible, protective measures such as wearing light-colored clothing, tucking pant legs into socks, and applying appropriate repellents to clothing and skin should be employed. Prompt inspection and removal of ticks are also very important. As in many tick-transmitted diseases, the tick must be attached for several hours before transmission takes place, thus the importance of tick removal.

Cases

In 2018, 30 cases were reported in Louisiana. Reported occurrence of RMSF in the state ranges from zero to 30 cases per year from 1988 to 2017. Since 2000, cases have been classified as confirmed or probable based on the level of diagnosis determined in each circumstance. In 2010, changes were made to the case definition to include 'suspect' category for those who were not classified as confirmed or probable. The incidence rate in the state during 2018 was 0.64 cases per 100,000 persons with case fatality rate of 1.05% compared to nationwide rates of less than 0.5%.

The number of cases has drastically increased, especially since 2010. This increase reflects the national trend that is particularly influenced by increased numbers of cases reported from suburban areas, presumably due to human migration into naturally pristine or forested areas, and a combination of new diagnostic tests and the changes in RMSF surveillance case definition in 2004 (Figure 1).

Figure 1: RMSF reported cases, (including both confirmed and probable)
Louisiana, 1988-2018

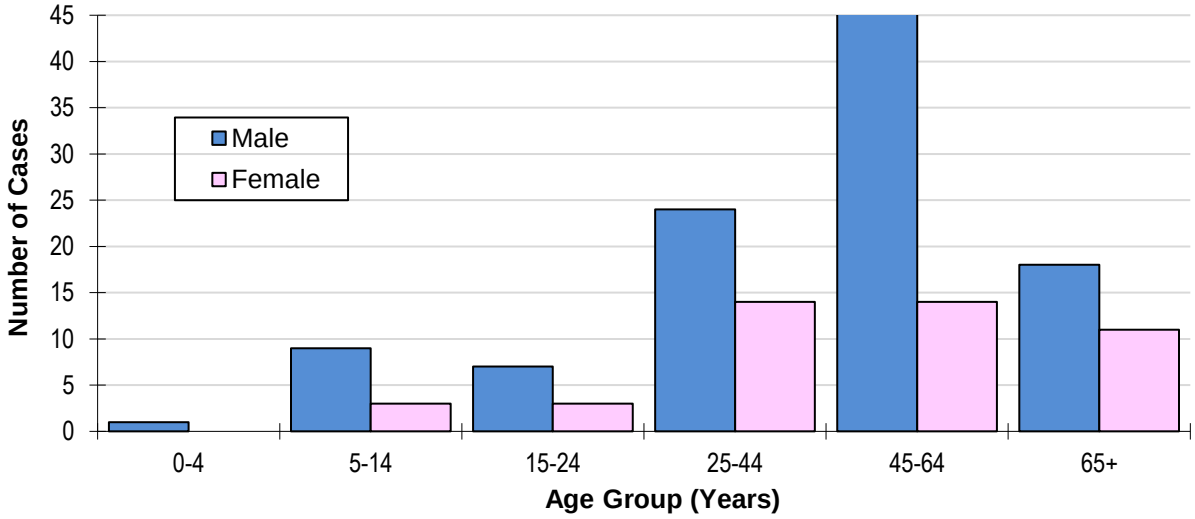


Gender and Age

Overall, more cases were reported among males (71%) than females. Data also indicated a huge

preponderance among males in the 45 to 64-year-old age group. Cases were more evenly distributed by gender in the 15 to 44-year-old age groups, and the older than 65-year age category (Figure 2).

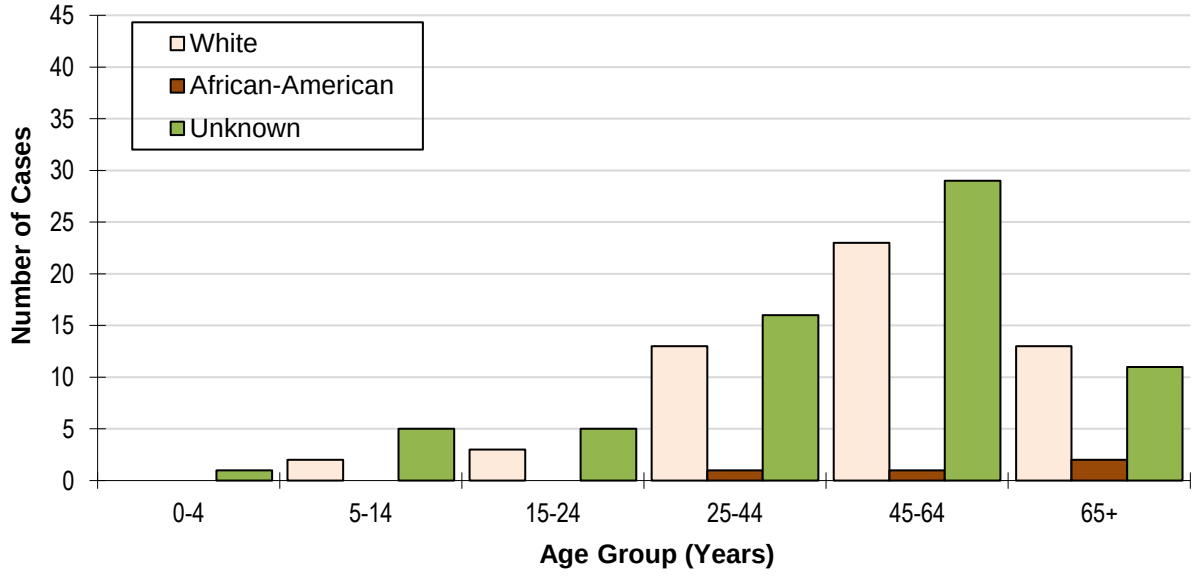
Figure 2: RMSF cases by age and gender, (including both confirmed and probable) Louisiana, 2005-2018



Race and Age

Nationally the frequency of RMSF is highest in males, American Indians, and people at least 40 years-old. In Louisiana, no cases were reported among American Indians. Whites comprised 48% of all reported cases, and 3% were African-American. All other cases were reported as other races or unknown from 2005 to 2018 (Figure 3).

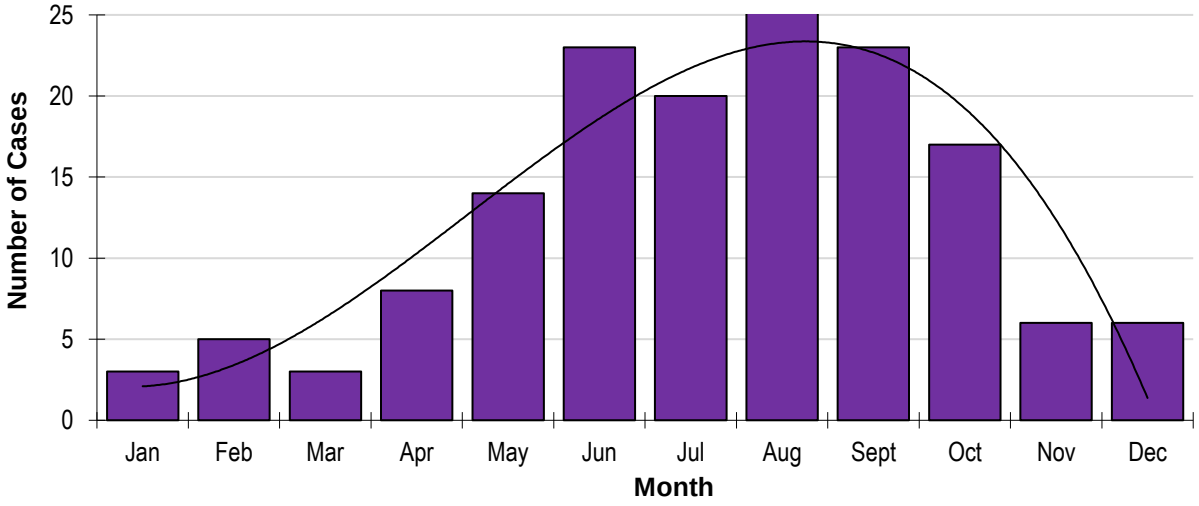
Figure 3: RMSF cases by age and race, (including both confirmed and probable) Louisiana, 2005-2018



Seasonality

In the U.S. the majority of cases are infected during summer months. In Louisiana, 74% of the cases occur between April and September (Figure 4).

Figure 4: RMSF reported cases, (including both confirmed and probable) by month of onset Louisiana, 2005-2018



Louisiana's sub-tropical climate likely fosters a longer period of tick activity. The peak in U.S. cases of RMSF occurs in June and July, but in Louisiana the peak months are June, July, August and September. There was a significant four-month peak from June to September (p=0.024), in past years (Figure 4).

Hospitalization

Healthcare settings are required to report all patients with RMSF to the Office of Public Health using case report forms, indicating the timing and nature of illness, with laboratory diagnosis. Data indicated that, in majority of the RMSF cases (66%), a confirmatory test for RMSF was not performed. Patients were treated based on index of suspicion and IgM or IgG antibody titers that were obtained only during an acute phase. Most suspected cases of RMSF are treated empirically with doxycycline leading to early recovery from illness and shorter duration of in-patient stay. Hence, obtaining titers using convalescent sera two to four weeks following illness for a confirmatory diagnosis, may not always be possible, which may explain the large number of 'probable' cases diagnosed in the state. Although immunofluorescence (IFA) has found to be the most sensitive and specific of all serologic tests, it is usually not positive in acute illness.

Diagnosing and confirming RMSF infections accurately is important in national surveillance efforts to estimate the true burden of the disease and to take necessary timely actions following case identification. Consistent use of single rapid confirmatory test like real-time PCR assay on clinical specimens that is shown to be highly sensitive and specific to diagnose RMSF when compared to the traditional PCR techniques used by the Centers for Disease Control and

Prevention should be encouraged. This reduces the need for a second titer sample for antibodies to RMSF by IFA to make a confirmed diagnosis.

Since 1999, 66% of the total RMSF cases that required hospital admission were males and approximately 38% were in the 45 to 64-year-old age group. In-patient data shows that 18.75% of all cases suffered at least one life threatening complication with meningitis and encephalitis adding up to 46% of those cases (Table 1).

Table 1: RMSF-associated hospitalizations, Louisiana 2005 – 2014

RMSF- Hospitalizations		
Age group	**Hospitalized**	**%**
< 5 years	1	1.7
5 - 14 years	10	17.5
15 - 24 years	4	7.0
25 - 44 years	8	14.0
45 - 64 years	22	38.5
65 +	12	21.0
Total	**57**	

The most frequently listed accompanying diagnoses with RMSF diagnosis included rash and other nonspecific skin eruptions (17.2%), hypertension (15.5%), hyponatremia and/or hypo-osmolality (12%), headache (10%), and other concurrent bacterial/viral infections (10%). Lyme disease (3.4%) was the most common tick borne illness diagnosed along with RMSF.

The impact of RMSF can be estimated by duration of hospitalization and the cost of treatment incurred. The median number of days and cost of treatment for people who were hospitalized with RMSF and associated complications or other accompanying diagnoses was three, (minimum three days, maximum 16 days) and $11,809.65 respectively (Table 2).

Table 2: RMSF-associated life threatening complications, Louisiana 2005 - 2014

Hospitalization		Life Threatening Complications			
Years	**Cases**	**ARF/CRF**	**DIC/Sepsis**	**E/M/ME**	**ARDS**
2005	5	0	1	0	0
2006	3	0	0	1	0
2007	5	0	0	1	0
2008	4	0	0	0	0
2009	5	0	0	0	0
2010	5	1	0	0	0
2011	13	0	1	1	0
2012	5	1	0	0	0
2013	2	0	0	0	0
2014	10	1	0	1	0
Total	**57**	**3**	**2**	**4**	**0**

During the period from 2005 to 2014, the number of reported cases (confirmed and probable) to The Infectious Disease Reporting Information System (IDRIS) was 104 with estimated hospitalization rates of 310 per 1000 RMSF cases.

Geography

A higher percentage of cases was reported from parishes that lie along the state border - Caddo, Bossier, Calcasieu, St. Tammany and Washington (Figure 5).

Figure 5: RMSF reported cases by parish, (including both confirmed and probable) Louisiana, 2005-2018